**40 V, 85 A, 2.6 mΩ Low $R_{DS(ON)}$**
**N ch Trench Power MOSFET**

# EKI04027

**Data Sheet**

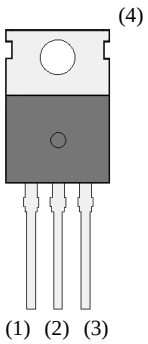
## Features

- $V_{(BR)DSS}$ ---------- 40 V ($I_D$ = 100 µA)
- $I_D$ ---------- 85 A
- $R_{DS(ON)}$ ----------3.2 mΩ max. ($V_{GS}$ = 10 V, $I_D$ = 82.5 A)
- $Q_g$------44.9 nC ($V_{GS}$ = 4.5 V, $V_{DS}$ = 20 V, $I_D$ = 82.5 A)

- Low Total Gate Charge
- High Speed Switching
- Low On-Resistance
- Capable of 4.5 V Gate Drive
- 100 % UIL Tested
- RoHS Compliant

## Package

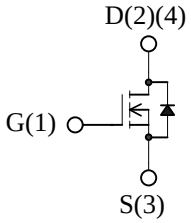
- TO220-3L




Not to scale

## Applications

- DC-DC converters
- Synchronous Rectification
- Power Supplies




## Absolute Maximum Ratings

- Unless otherwise specified, $T_A$ = 25 °C

| Parameter | Symbol | Test conditions | Rating | Unit |
|---|---|---|---|---|
| Drain to Source Voltage | $V_{DS}$ | | 40 | V |
| Gate to Source Voltage | $V_{GS}$ | | ± 20 | V |
| Continuous Drain Current | $I_D$ | $T_C$ = 25 °C | 85 | A |
| Pulsed Drain Current | $I_{DM}$ | PW ≤ 100µs<br>Duty cycle ≤ 1 % | 170 | A |
| Continuous Source Current (Body Diode) | $I_S$ | | 85 | A |
| Pulsed Source Current (Body Diode) | $I_{SM}$ | PW ≤ 100µs<br>Duty cycle ≤ 1 % | 170 | A |
| Single Pulse Avalanche Energy | $E_{AS}$ | $V_{DD}$ = 20 V, L = 1 mH,<br>$I_{AS}$ = 13 A, unclamped,<br>$R_G$ = 4.7 Ω<br>Refer to Figure 1 | 170 | mJ |
| Avalanche Current | $I_{AS}$ | | 30 | A |
| Power Dissipation | $P_D$ | $T_C$ = 25 °C | 135 | W |
| Operating Junction Temperature | $T_J$ | | 150 | °C |
| Storage Temperature Range | $T_{STG}$ | | − 55 to 150 | °C |

## Thermal Characteristics

• Unless otherwise specified, $T_A$ = 25 °C

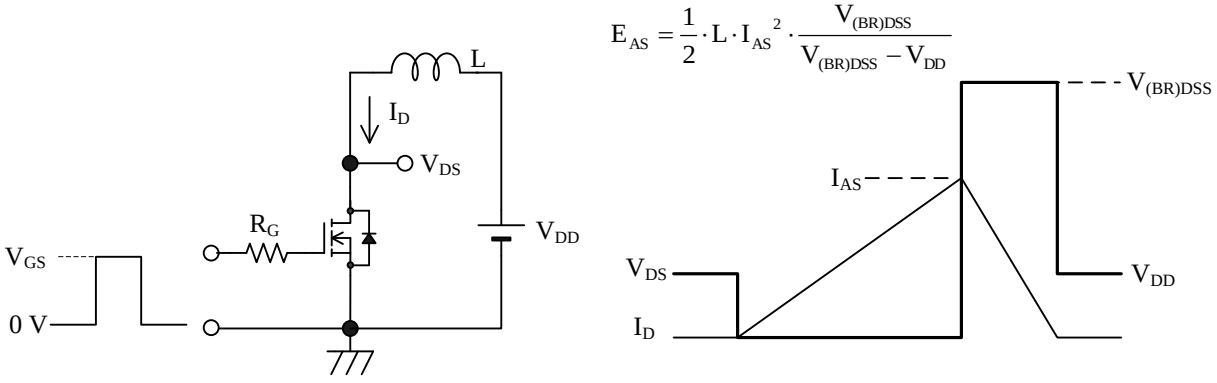
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Thermal Resistance (Junction to Case) | $R_{\theta JC}$ | | – | – | 0.9 | °C/W |
| Thermal Resistance (Junction to Ambient) | $R_{\theta JA}$ | | – | – | 62.5 | °C/W |

## Electrical Characteristics

• Unless otherwise specified, $T_A$ = 25 °C

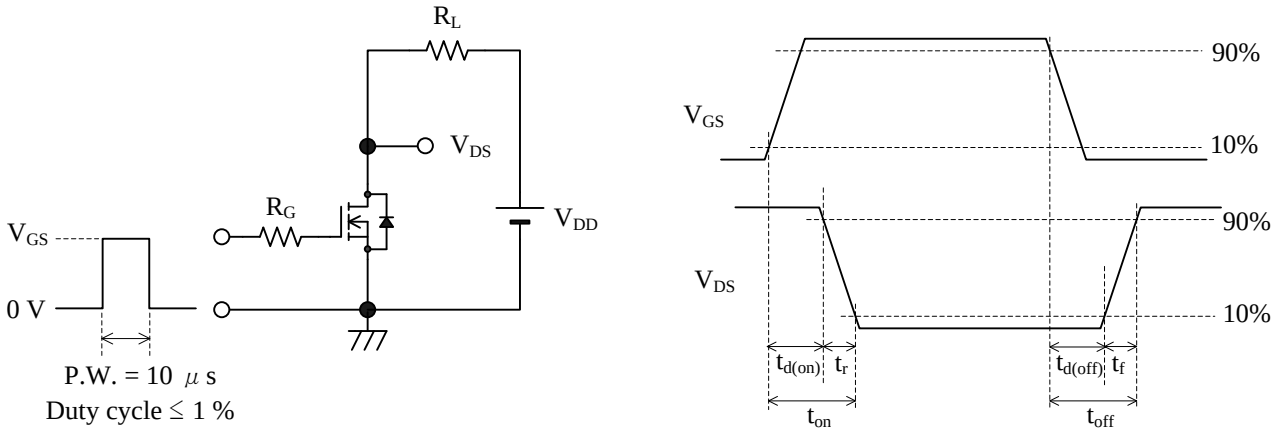
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$ = 100 µA, $V_{GS}$ = 0 V | 40 | – | – | V |
| Drain to Source Leakage Current | $I_{DSS}$ | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V | – | – | 100 | µA |
| Gate to Source Leakage Current | $I_{GSS}$ | $V_{GS}$ = ± 20 V | – | – | ± 100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 1.5 mA | 1.0 | 2.0 | 2.5 | V |
| Static Drain to Source On-Resistance | $R_{DS(ON)}$ | $I_D$ = 82.5 A, $V_{GS}$ = 10 V | – | 2.6 | 3.2 | mΩ |
| | | $I_D$ = 41.3 A, $V_{GS}$ = 4.5 V | – | 3.1 | 4.0 | mΩ |
| Gate Resistance | $R_G$ | f = 1 MHz | – | 0.8 | – | Ω |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 25 V<br>$V_{GS}$ = 0 V<br>f = 1 MHz | – | 6200 | – | pF |
| Output Capacitance | $C_{oss}$ | | – | 960 | – | |
| Reverse Transfer Capacitance | $C_{rss}$ | | – | 640 | – | |
| Total Gate Charge ($V_{GS}$ = 10 V) | $Q_{g1}$ | $V_{DS}$ = 20 V<br>$I_D$ = 82.5 A | – | 93.7 | – | nC |
| Total Gate Charge ($V_{GS}$ = 4.5 V) | $Q_{g2}$ | | – | 44.9 | – | |
| Gate to Source Charge | $Q_{gs}$ | | – | 15.2 | – | |
| Gate to Drain Charge | $Q_{gd}$ | | – | 16.2 | – | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = 20 V<br>$I_D$ = 82.5 A<br>$V_{GS}$ = 10 V, $R_G$ = 4.7 Ω<br>Refer to Figure 2 | – | 9.7 | – | ns |
| Rise Time | $t_r$ | | – | 13.2 | – | |
| Turn-Off Delay Time | $t_{d(off)}$ | | – | 45.5 | – | |
| Fall Time | $t_f$ | | – | 28.0 | – | |
| Source to Drain Diode Forward Voltage | $V_{SD}$ | $I_S$ = 82.5 A, $V_{GS}$ = 0 V | – | 0.9 | 1.5 | V |
| Source to Drain Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 82.5 A<br>di/dt = 100 A/µs<br>Refer to Figure 3 | – | 43.9 | – | ns |
| Source to Drain Diode Reverse Recovery Charge | $Q_{rr}$ | | – | 44.8 | – | nC |

## Test Circuits and Performance Curves



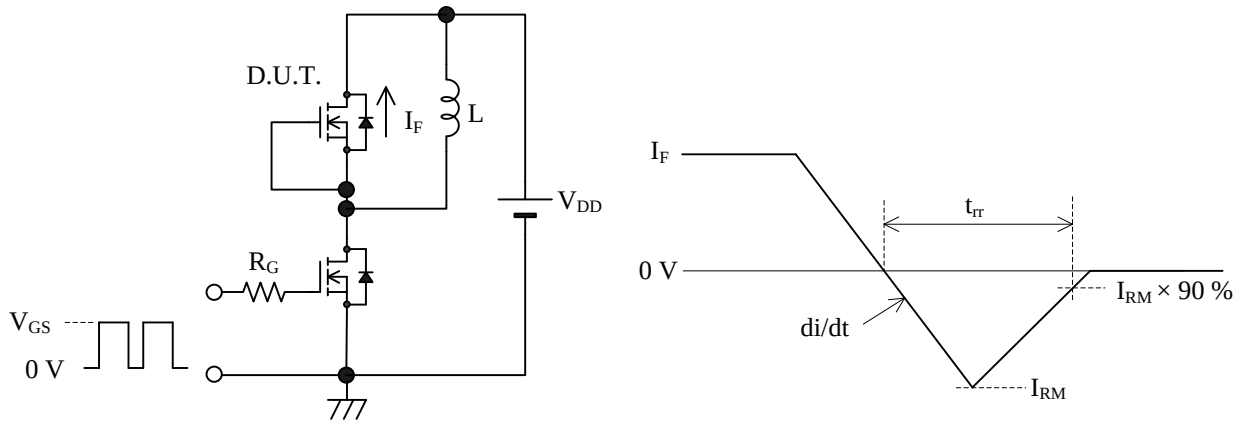

(a) Test Circuit (b) Waveform

Figure 1. Unclamped Inductive Switching




(a) Test Circuit (b) Waveform

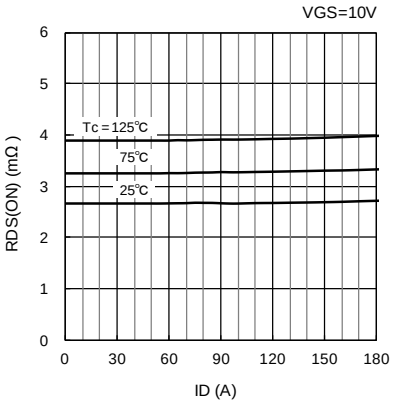
Figure 2. Switching Time



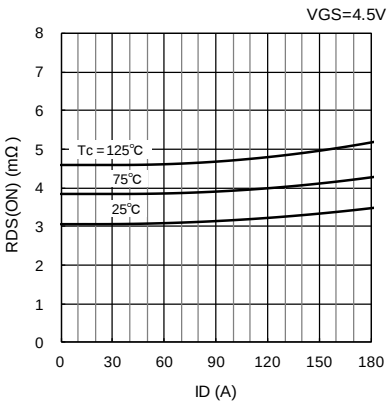

(a) Test Circuit (b) Waveform

Figure 3. Diode Reverse Recovery Time

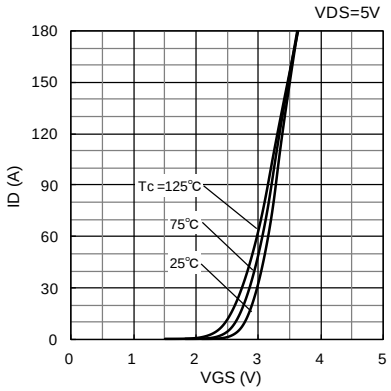
RDS(ON)-ID characteristics (typical)



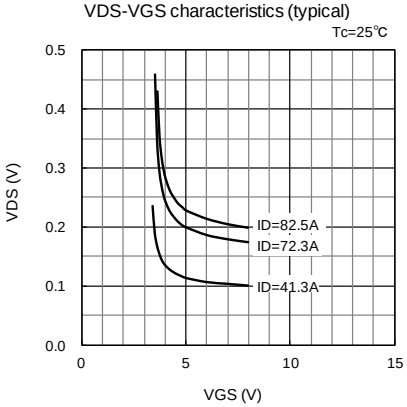

RDS(ON)-ID characteristics (typical)



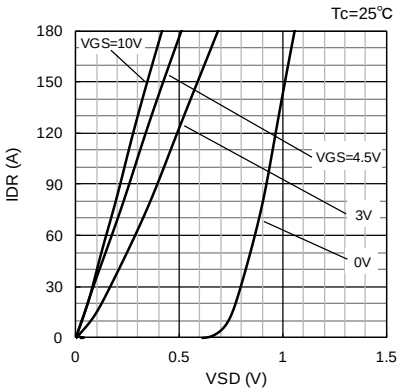

ID-VGS characteristics (typical)



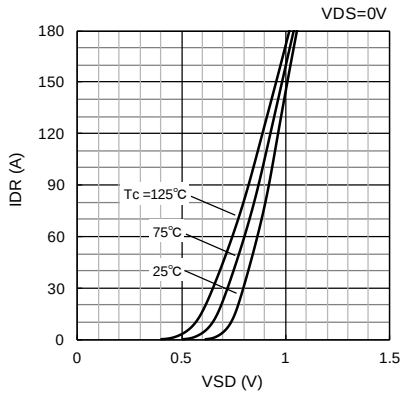

VDS-VGS characteristics (typical)



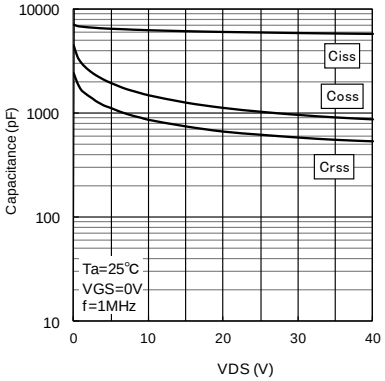

IDR-VSD characteristics (typical)



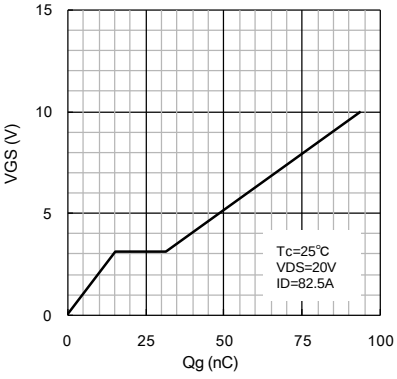

IDR-VSD characteristics (typical)



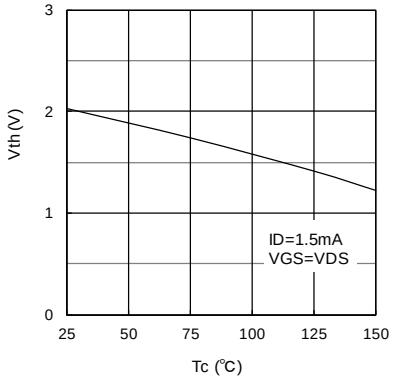

Capacitance-VDS characteristics (typical)



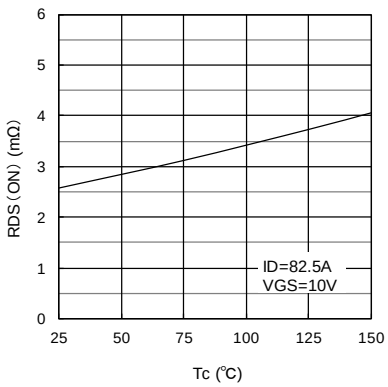

VGS - Qg characteristics (typical)



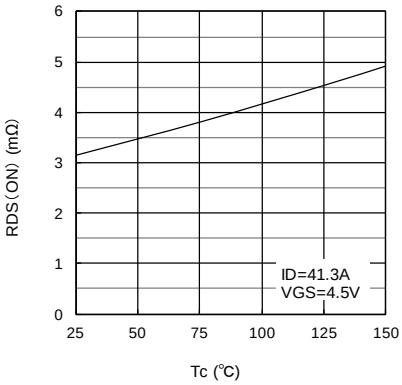

Vth-Tc characteristics (typical)



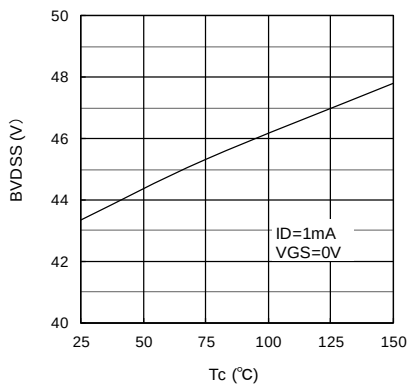

RDS(ON)-Tc characteristics (typical)



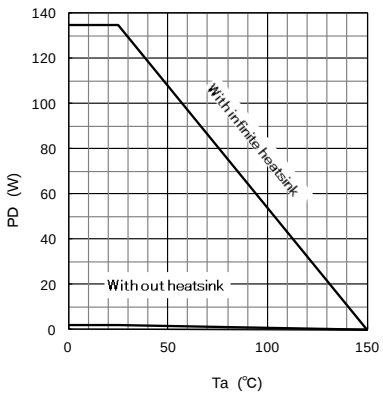

RDS(ON)-Tc characteristics (typical)



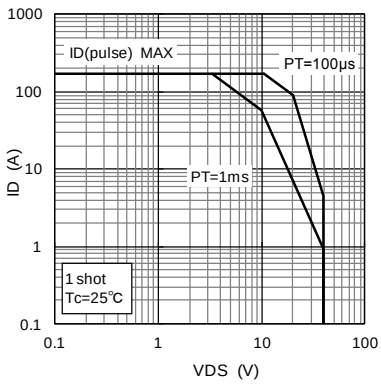

BVDSS-Tc characteristics (typical)



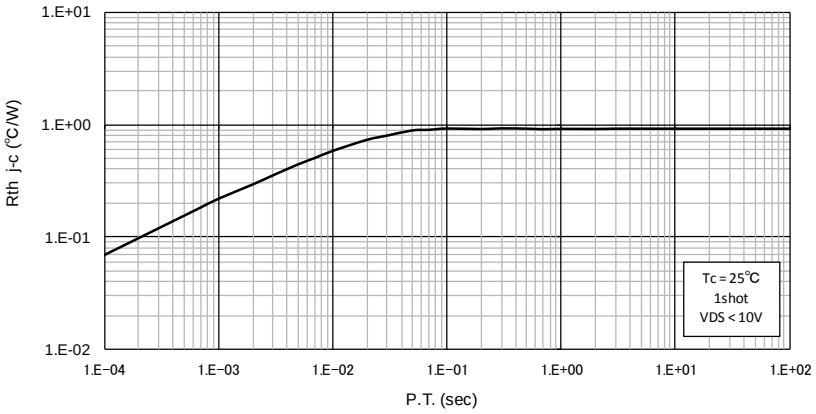
PD-Ta Derating




SAFE OPERATING AREA

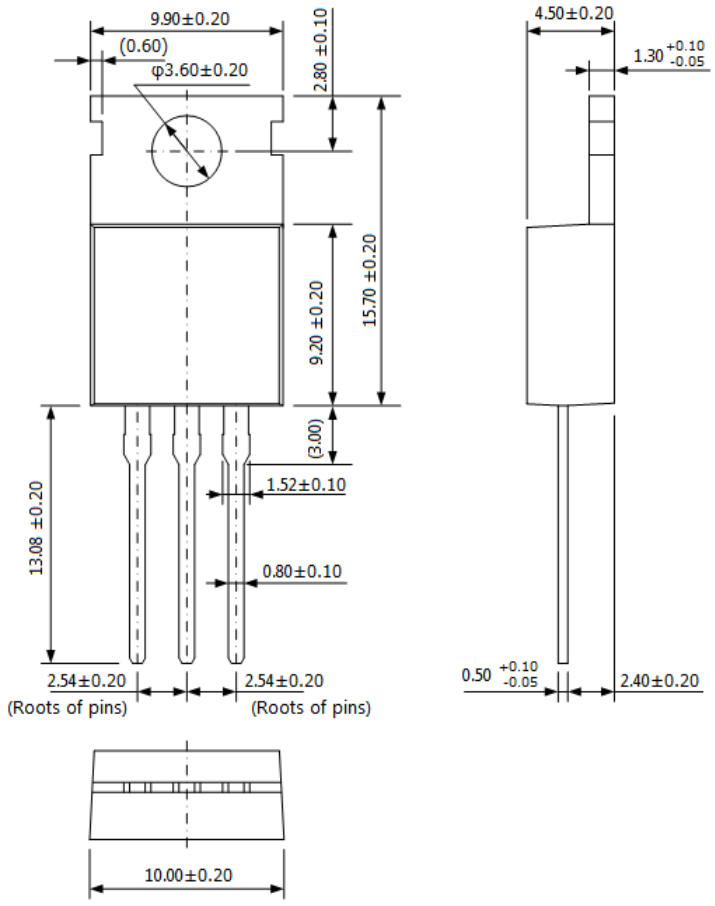



**TRANSIENT THERMAL RESISTANCE - PULSE WIDTH**



## Physical Dimensions

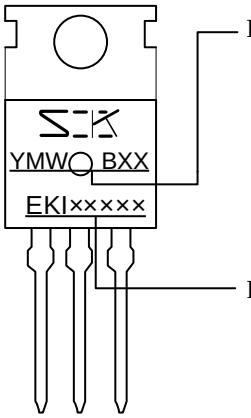
● TO220-3L




**NOTES:**

- Dimensions in millimeters
- Maximum gate burr height is 0.3 mm.
- Bare lead frame: Pb-free (RoHS compliant)
- When soldering the products, it is required to minimize the working time, within the following limits:
  Flow: 260 ± 5 °C / 10 ± 1 s, 2 times
  Soldering Iron: 380 ± 10 °C / 3.5 ± 0.5 s, 1 time
  Soldering should be at a distance of at least 1.5 mm from the body of the product.
- Recommended screw torque for TO220: 0.490 N·m to 0.686 N·m (5 kgf·cm to 7 kgf·cm)

## Marking Diagram




Lot Number:
Y is the last digit of the year of manufacture (0 to 9)
M is the month of the year (1 to 9, O, N, or D)
W is the week of the month (1 to 5)
B expresses Pb free pins
XX is the control number

Part Number

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